



Per 17249
#4

In re the Application of

Keever et al.

Serial No. 10/073,500

Filed: February 11, 2002

Entitled

METHOD AND APPARATUS FOR
TREATING WASTEWATER

Group Art Unit: 1724

Examiner: Not Assigned Yet

Atty. Docket No.: 1370-CIP-00

Date: April 25, 2002

TECHNOLOGY CENTER 1700

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PETITION UNDER 37 C.F.R. § 1.102

Commissioner for Patents
Washington, D.C. 20231

Sir:

This petition requests that the subject application be granted Special Status for advancement of examination out of turn.

The requirements of 37 C.F.R. § 1.102 and MPEP § 708.02 are fulfilled as follows:

1. A check for the appropriate fee (\$130.00) as set forth in 37 C.F.R. §1.117(i) is attached hereto.
2. The patent application which was filed on February 11, 2002 presents Claims 1 - 24 drawn to a single invention. In the event that restriction is required, an election will be made without traverse.
3. The application is a "new application." No Examiner has examined the application or mailed an Office Action on the merits.

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4. A pre-examination search was made. The class and subclasses searched were 210/711, 712, 713, 714, 727, 738, both U.S. and foreign art, in the PTO pursuant to a discussion with Examiner Joseph Drodge in Group 1723. Also, a search was conducted in the European Patent Office in a related application. An Information Disclosure Statement (IDS) is filed concurrently herewith along with the European Patent Office Search Report. The listed publications, copies enclosed, represent the results of the search. Other publications already known to the Applicants are also included in the Information Disclosure Statement.
5. A copy of each of the cited publications is enclosed for the record.
6. A detailed discussion of the publications follows, pointing out, with particularity as set forth in 37 C.F.R. §§ 1.111(b) and (c), that the claimed subject matter is patentable over the cited publications.

Applicants respectfully submit that all requirements called for by the applicable rules have been fulfilled. Applicants respectfully request early favorable action on this Petition.

DETAILED DISCUSSION OF THE RELATED ART

This detailed discussion of the related art is submitted as part of a Petition to Make Special pursuant to 37 C.F.R. § 1.102 and MPEP § 708.02.

The publications uncovered during the pre-examination search, and those already cited by the Applicants are discussed below.

Publications

No.	Patent Serial No.	Inventor	Date Issued	Title
<i>U.S. Patents</i>				
1.	U.S. 3,350,302	Demeter et al.	10/31/67	CLARIFICATION OF SURFACE WATERS
2.	U.S. 4,139,456	Yabuuchi et al.	02/13/79	PROCESS FOR OXIDATION TREATMENT OF Fe ²⁺ IN WASTE WATER
3.	U.S. 4,282,093	Haga et al.	08/04/81	APPARATUS FOR DETECTING COAGULATION EFFECT
4.	U.S. 4,290,898	von Hagel et al.	09/22/81	METHOD AND APPARATUS FOR MECHANICALLY AND CHEMICALLY TREATING LIQUIDS
5.	U.S. 4,320,012	Palm et al.	03/16/82	NEUTRALIZATION OF PHOSPHORIC ACID WASTE WATERS
6.	U.S. 4,388,195	von Hagel et al.	06/14/83	PROCESS AND APPARATUS FOR THE CHEMICAL-MECHANICAL TREATMENT AND PURIFICATION OF GROUND WATERS, SURFACE WATERS AND EFFLUENTS
7.	U.S. 4,465,597	Herman et al.	08/14/84	TREATMENT OF INDUSTRIAL WASTEWATERS
8.	U.S. 4,579,655	Louboutin et al.	04/01/86	APPARATUS FOR TREATING WATER BY FLOCCULATION AND/OR CRYSTALLINE PRECIPITATION, SETTLING AND SLUDGE RECYCLING
9.	U.S. 4,724,085	Pohoreski	02/09/88	METHOD FOR THE CLARIFICATION OF SEWAGE AND OTHER WASTES
10.	U.S. 4,818,404	McDowell	04/04/89	SUBMERGED BIOLOGICAL WASTEWATER TREATMENT SYSTEM
11.	U.S. 4,855,061	Martin	08/08/89	METHOD AND APPARATUS FOR CONTROLLING THE COAGULANT DOSAGE FOR WATER TREATMENT
12.	U.S. 4,927,543	Bablon et al.	05/22/90	METHOD AND INSTALLATION FOR TREATING LIQUID BY SEDIMENTATION USING FINE SAND
13.	U.S. 5,112,499	Murray et al.	05/12/92	PROCESS FOR TREATING POND WATER
14.	U.S. 5,306,422	Krofta	04/26/94	COMPACT CLARIFIER SYSTEM FOR MUNICIPAL WASTE WATER TREATMENT
15.	U.S. 5,348,653	Rovel	09/20/94	PROCESS FOR THE BIOLOGICAL PURIFICATION OF EFFLUENT
16.	U.S. 5,441,634	Edwards	08/15/95	APPARATUS AND METHOD OF CIRCULATING A BODY OF FLUID CONTAINING A MIXTURE OF SOLID WASTE AND WATER AND SEPARATING THEM

17.	U.S. 5,601,704	Salem et al.	02/11/97	AUTOMATIC FEEDBACK CONTROL SYSTEM FOR A WATER TREATMENT APPARATUS
18.	U.S. 5,730,864	Delsalle et al.	03/24/98	INSTALLATION FOR TREATING AN UNTREATED FLOW BY SIMPLE SEDIMENTATION AFTER BALLASTING WITH FINE SAND
19.	U.S. 5,770,091	Binot et al.	06/23/98	METHOD OF PLAIN SEDIMENTATION AND PHYSICAL-CHEMICAL SEDIMENTATION OF DOMESTIC OR INDUSTRIAL WASTE WATER
20.	U.S. 5,800,717	Ramsay et al.	09/01/98	WATER AND WASTEWATER TREATMENT SYSTEM WITH INTERNAL RECIRCULATION
21.	U.S. 5,840,195	Delsalle et al.	11/24/98	METHOD AND INSTALLATION FOR TREATING AN UNTREATED FLOW BY SIMPLE SEDIMENTATION AFTER BALLASTING WITH FINE SAND
22.	U.S. 6,126,838	Huang et al.	10/03/00	METHOD OF WASTEWATER TREATMENT BY ELECTROLYSIS AND OXIDIZATION
23.	U.S. 6,210,588	Vion	04/03/01	METHOD FOR THE PHYSICO-CHEMICAL TREATMENT OF EFFLUENTS IN PARTICULAR SURFACE WATER FOR CONSUMPTION
24.	U.S. 6,277,285	Vion	08/21/01	PROCESS FOR THE CLARIFICATION OF LIQUIDS AND SUSPENSIONS
French Patents Publ. Date				
1.	FR 1,411,792		08/16/65	PROCESS FOR THE CLARIFICATION AND PURIFICATION OF SURFACE WATERS AND INDUSTRIAL WATERS CONTAINING MATERIALS IN SUSPENSION
2.	DE 43 33 579 A1		04/06/95	PROCESS FOR CONTROLLING THE QUANTITIES OF CHEMICAL AIDS AND FLOCCULANTS AS A FUNCTION OF AN ONLINE WEIGHT/SOLIDS MEASUREMENT FOR CLARIFICATION AND DEHYDRATION PROCESSES OF ALL TYPES AND AN INSTALLATION FOR IMPLEMENTATION OF THE PROCESS
3.	JP 2001-79562		03/27/01	METHOD FOR THE ELIMINATION OF SUSPENDED SOLIDS FROM YARD DRAINAGE WATER

<i>Other Documents</i>	
1.	Moffa et al., <i>Retrofitting Control Facilities for Wet-Weather Flow Treatment</i> , EPA#/600/R-00/020, January 2000
2.	ACTIFLO Flow Diagram
3.	Biofor™ Biological Aerated Filtration - <i>Wastewater Treatment Technology for the 21st Century</i> , Infilco Degremont Inc., September 1997
4.	DensaDeg® High Rate Clarifier and Thickener, Infilco Degremont Inc., August 1997

Description of the Invention

The invention relates broadly to a method and apparatus for treating wastewater. More particularly, the invention relates to a method and apparatus for treating wastewater that is capable of handling not only ordinary, everyday flow rates and pollutants of wastewater, but also achieves at least comparable, if not better, wastewater treatment during surge periods and/or wet weather conditions. Thus, the invention solves the longstanding problem in the art wherein periodic variations in the flow of wastewater are higher than the capacity of the standard system such that extraordinary measures need to be taken to accommodate the additional load. Such accommodations include passing the wastewater directly through the system without adequate treatment and discharge, which is unacceptable, storing the excess untreated wastewater in a storage facility, which incurs high capital expenditures, or providing systems utilizing ballast material, which complicates the system and adds additional capital and operating costs. Another alternative has been to increase the size of the wastewater treatment facility sufficiently to operate at the peak flows. However, this is wasteful of capacity inasmuch as the majority of the capacity of the plant remains unused during the vast majority of operating periods.

Accordingly, the apparatus aspect of the invention includes a physical-chemical reactor, a chemical supply operably connected to the physical-chemical reactor, a clarifier

operably connected to and located downstream of the physical-chemical reactor, and a control system that directs influent into the clarifier when influent conditions are within a selected range. When the influent conditions are within a selected different range, the control system directs influent and chemicals to the physical-chemical reactor and then into the clarifier.

Similarly, the method aspect of the invention includes a method of treating a variable flow of wastewater comprising removing selected solid materials from the wastewater, during a normal flow or pollutant-loading of wastewater, subjecting the wastewater to clarification in a clarifier, and during high influent conditions adding coagulant and/or flocculant and/or other reagents to the wastewater, subjecting the resulting mixture to agitation in a physical-chemical reactor and subjecting the resulting mixture to settling in the clarifier.

Description of the Publications

The DensaDeg® High Rate Clarifier and Thickener product literature discloses a system and method which is a classic solid contact clarifier well known in the art and includes three different treatment zones. The reactor zone includes a draft tube wherein influent water is combined with reactants and preformed solids that have been recirculated from the pre-settling/thickener zone. As the materials flow through the draft tube, the water reactants and thickener solids are mixed by an agitator which forms a flocculating mixture. The flocculated mixture moves downwardly in the reactor zone and moves through a baffled opening to exit the reactor wherein the flocculated mixture moves upwardly and passes over a weir into the pre-settling/thickener zone. The resulting slurry

moves downwardly through the pre-settling zone to a point near the bottom of the zone, turns upwardly beneath a baffle which vertically divides the zone and, because of the higher density of the solids within the flocculated mixture, the solids are deposited near the bottom of the zone. Clarified effluent exits through lamellar settling tubes.

U.S. Patent 5,770,091 discloses a method and system for treating wastewater by sedimentation during dry periods and wet periods. During dry periods, wastewater is channeled to a traditional sedimentation-degreasing basin and, after sedimentation, is channeled to typical downstream treatment stages. However, during wet weather, the wastewater is channeled to an alternative location wherein coagulant is added, ballast is added and the resulting wastewater agitated. Then, the wastewater is transferred to another chamber wherein flocculent is added and the mixture agitated. Only at that time, does the wastewater flow to the standard sedimentation-degreasing basin.

U.S. Patent 5,840,195 discloses a system and method for treating wastewater with sedimentation utilizing ballasting with fine sand. The system includes a first chamber which receives wastewater and coagulant, the mixture being agitated. The wastewater then flows to a related second chamber wherein flocculent and sand ballast is added to the wastewater and further agitated. The mixture is then removed to an intermediate zone for flocculation to occur. The wastewater is then channeled to a sedimentation basin for differential sedimentation. Sludge having settled to the bottom of the basin is cleaned in order to recycle the ballast sand.

U.S. Patent 4,927,543 discloses another method and system for treating wastewater by differential sedimentation utilizing fine sand. Wastewater and flocculent are channeled into a first mixing chamber, together with sand. The mixture is transferred to an

intermediate aggregation chamber wherein flocculation occurs. The wastewater is then moved to a differential sedimentation area wherein sludge settles downwardly and effluent is passed through separator plate assemblies prior to exiting the system. Sludge is removed in a usual manner and the sand is separated for recycling.

U.S. Patent 5,800,717 discloses a wastewater treatment system utilizing differential sedimentation in conjunction an internal recirculating tube. Sand or ballast, flocculent and coagulant are introduced into the international recirculation tube along with wastewater and agitated. The flow of mixed wastewater moves upwardly, over a weir and downwardly into a differential sedimentation zone. Sludge settles to the bottom of the zone while effluent moves upwardly through settling plates/tubes prior to exiting the system. Sand is separated from the sludge and recirculated.

The ACTIFLO product literature discloses a system that is comprised of four zones. Wastewater and coagulant is introduced into a first mixing chamber wherein coagulation occurs. The mixed water and coagulant is channeled to a second chamber wherein sand and polymer are added. The wastewater then flows to a maturation zone where further mixing occurs. Then, the wastewater is introduced into a differential sedimentation basin wherein sludge settles downwardly and effluent moves upwardly through separator plates/tubes prior to exiting the system. Sand is recycled for further use.

EPA Document No. 600/R-00/020 discloses a number of retrofitted control facilities for treating wastewater in dry and wet conditions.

French Patent No. 1,411,792 discloses a process for clarifying water wherein raw water is pretreated with alum and mixed with polymer and sand prior to introduction into the bottom portion of a closed system containing an agitator. The mixture flows from the

bottom portion of the closed cylinder upwardly and over top of the closed cylinder into a differential settling zone wherein ballasted sludge settles downwardly and is sent to a separator to recycle sand. Effluent passes upwardly to and over the top of the main clarifier basin.

U.S. Patent 6,126,838 discloses a method of treating wastewater by electrolysis and oxidation wherein the wastewater is introduced into an upper portion of a chamber containing particulate carrier, the particulate carrier being formed into a fluidized bed.

U.S. Patent 5,441,634 discloses an apparatus and method for treating water by separating out solid materials. Both aerobic and anaerobic treatment can be utilized.

U.S. Patent 5,306,422 discloses a clarifier system for municipal wastewater which utilizes at least one vertical stack of dissolved air flotation clarifiers.

U.S. Patent 4,818,404 discloses a biological wastewater treatment system which causes contact between biological populations in the water and attach to a fixed surface and liquid chemicals and gases.

U.S. Patent 4,724,085 discloses a method of treating sewage by clarification including adding alum, polyelectrolyte and an ionic surface active compound to the wastewater, agitating the mixture and then permitting particulate matter to settle as sludge. Preferably, a portion of the sludge is recycled to the wastewater to be treated.

U.S. Patent 4,579,655 discloses a system for treating water by flocculation, differential settling and sludge recycling. A reaction tank receives wastewater to be treated and is mixed with recycled sludge, a second zone receives the wastewater for flocculation or crystalline precipitation of sludge from the water. Sludge differentially settles

downwardly while effluent moves upwardly and flows over a weir. A sludge collector removes the sludge and recycles a portion to the reaction tank.

U.S. Patent 5,112,499 discloses a system for treating pond or lake water.

U.S. Patent 4,465,597 discloses a system for treating industrial wastewater wherein heavy metals dissolved in the wastewater precipitate as a slurry and are then permitted to settle out in a sludge form.

U.S. Patent 4,320,012 discloses a method of treating cooling pond water generated from wet process phosphoric acid plants and neutralizing waste from such plants.

U.S. Patent 4,290,898 discloses a system for clarifying wastewater. The system includes a combined sedimentation and thickening tank divided into several zones including a first sedimentation zone flowing through horizontally inclined channels on the surface of which the deposit settles and passes downwardly, withdrawing the deposit from the lower channel ends by distributing it uniformly over a second lower zone arranged adjacent the lower channel ends.

U.S. Patent 4,139,456 discloses a process for oxidation treatment of Fe^{2+} contained in wastewater.

U.S. Patent 4,388,195 discloses a process for treating wastewater including a first zone wherein additives are admixed to wastewater with agitation, a second zone wherein contact sludge is admixed with further agitation, a flocculent is added with agitation under high energy and, as an alternative, a zone for the formation of coarse flocks and completion of reaction from the previously added materials to form a differential settleable material. The water is then introduced into a differential settlement zone wherein sludge

moves downwardly and effluent exits through settling plates and an upper portion of the differential settlement zone.

JP 2001-79562 discloses a process and apparatus for reducing suspended solids from drainage water from storage yards in steel mills. The drainage water is channeled first to a metering tank, followed by a pair of flocculation zones wherein flocculant is added in a certain amount during low water conditions and an increased amount of flocculant is added in high water conditions. The wastewater is then forwarded through a filtration unit and on to a clarifier, depending on the water level.

DE 4333579 A1 discloses a process and a system for controlling quantities of chemicals and flocculants added to wastewater as a function of an online weight/solids measurement for clarification and dehydration. The process is based on the recognition of and compensation for temperature and pressure values and mass/solid content. A signal corresponding to the mass concentration in the wastewater is generated which determines the addition of an amount of solids-poor to solids-free medium is introduced.

Analysis of the Cited Art

Independent Claims 1, 9 and 11 are representative of the claimed invention. They contain common elements/steps with respect to a physical-chemical reactor, a chemical supply connected to the physical-chemical reactor and a clarifier connected to and located downstream from the physical-chemical reactor. The control system directs influent into the clarifier when influent conditions are within a selected range and the physical-chemical reactor and then into the clarifier when the influent conditions are within a selected different range. The control system may also direct ballast generated within the clarifier

into the physical-chemical reactor through the ballast recirculation line when the influent conditions are within the selected different range and chemicals to the physical-chemical reactor.

Claims 1, 9 and 11 are reproduced below for the Examiner's convenience.

1. An apparatus for treating wastewater comprising:
 - a physical-chemical reactor;
 - a chemical supply operably connected to the physical-chemical reactor;
 - a clarifier operably connected to and located downstream of the physical-chemical reactor;
 - a ballast recirculation line operably connected between the clarifier and the physical-chemical reactor; and
 - a control system that directs
 - unconditioned influent into the clarifier when influent conditions are within a selected range, and
 - conditioned influent, resulting from direct or indirect introduction of chemicals and recirculated ballast generated within the clarifier, into the physical-chemical reactor and then into the clarifier when the influent conditions are within a selected different range.
9. An apparatus for treating wastewater which operates without introducing ballast material supplied from outside comprising:
 - a physical-chemical reactor which operates without introducing ballast material supplied from outside;

a clarifier operably connected to and located downstream of the physical-chemical reactor;

a chemical supply operably connected to the physical-chemical reactor which operates without introducing ballast material supplied from outside; and

a control system that directs

a) influent into the clarifier when influent conditions are within a selected range, and

b) chemicals, either directly or indirectly, and influent into the physical-chemical reactor and then into the clarifier when the influent conditions are within a selected different range.

11. An apparatus for treating wastewater comprising:

one physical-chemical reactor;

a chemical supply operably connected to the physical-chemical reactor;

a clarifier operably connected to and located downstream of the physical-chemical reactor; and

a control system that directs

a) influent into the clarifier when influent conditions are within a selected range, and

b) chemicals, either directly or indirectly, and influent into the physical-chemical reactor and then into the clarifier when the influent conditions are within a selected different range.

None of the related art known or discovered by the Applicants teaches or suggests this apparatus. The vast majority of the prior art does not even recognize the problems

associated with different flow rates over the course of time, much less teach or suggest any solution to such problems.

U.S. Patent 5,770,091 does recognize the problem and provides a complete system calculated to solve the problem. As noted above, it utilizes a conventional sedimentation-degreasing area 2 into which is fed wastewater for sedimentation. Effluent then travels downstream for further treatment in the usual manner. This is the ordinary set-up for normal flow conditions.

However, when the flow entering the system exceeds the ability of the regular sedimentation-degreasing area capacity, the wastewater is first directed into a channel 11 and into which coagulant is added via channel 80. The coagulant and wastewater are then directed into an injection tank which is provided with an agitator 141 to coagulate the wastewater. The wastewater then flows to maturation tank 15 wherein flocculent is added from a supply 90 and still further agitated. The flow then moves into the typical channel 13 and into sedimentation area 2.

Unfortunately, this system suffers drawbacks in that the flocks moving into the sedimentation area 2 are unable to settle at a sufficient velocity to meet peak flows. Hence, this is a significant drawback in the system. In any event, there is a complete failure to teach or suggest the invention as it is recited in representative Claims 1 - 43 wherein ballast generated within the clarifier is recirculated and introduced into the physical-chemical reactor. This is advantageous in those claims and not disclosed, taught or suggested in U.S. Patent 5,770,091.

U.S. Patent 4,724,085 teaches recycling of sludge into a zone wherein alum, cationic polyelectrolyte and anionic surface active compound are added. However, there

is not even a recognition of the peak flow problem recognized by the Applicants and there is nothing in the '085 patent that teaches or suggests to one of ordinary skill in the art that there would be any advantage in the context of the invention to so do. Moreover, there is no coupling of what is essentially a physical-chemical reactor in the '085 patent with a typical clarifier utilized in the municipal wastewater context.

The DensaDeg® product literature also discloses recycling of external sludge. However, it too in no way teaches or suggests a system or methodology that can solve the peak flow problem associated with typical clarifiers. In fact, it is oftentimes utilized to handle peak flow all by itself in conjunction with a separate facility designed to meet “normal” loads. Therefore, there would be no incentive to utilize it in conjunction with a normal clarifier.

U.S. Patents 5,800,717, 4,927,543 and 5,840,195 all teach recycling of ballast. However, such ballast is artificial ballast in the form of sand, and is not recycling of ballast generated within the clarifier. Of course, it is highly disadvantageous to introduce additional materials into the process due to the increase of operating costs.

U.S. Patent 4,579,655 also discloses a physical-chemical reactor. However, there is no appreciation for changes in flow rate or any teachings or suggestions to those of ordinary skill in the art how such variations in flow rate could be accommodated. There is also no disclosure, teachings or suggestions with respect to utilizing the apparatus of that disclosure in conjunction with ordinary clarifiers.

JP 2001-79562 discloses a pair of physical-chemical reactors which receive a flocculant. JP '562 also recognizes the difference between low water conditions and high

water conditions. However, they simply vary the quantity of flocculant added to the wastewater, depending on the level of the wastewater.

The remaining publications all disclose variations of treating wastewater either with or without the addition of flocculants, polymers and/or externally supplied ballast. However, none of them teach the novel and clearly non-obvious combination of elements/steps that enable the Applicants to overcome the longstanding problem of treating not only normal flows of wastewater, but peak flows of wastewater with maximum efficiency from an operational standpoint and also from the standpoint of minimal capital expense upon installation of the system.

Applicants respectfully request that the Petition to Make Special be granted, and that the application be taken out of turn for examination. Applicants also respectfully request, in light of the detailed description of the related art, early consideration and allowance of the solicited claims.

Respectfully submitted,



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